

NASA TECH BRIEF

Marshall Space Flight Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Vacuum-Stripped Silicone Binder for Thermal-Control Paint

Thermal-control paints are used in space vehicles to protect men and equipment from solar radiation heat. Protection from solar heat, of course, is not limited to space applications. Nearly everyone has experienced the scorching heat in sun-baked buildings and automobiles on a hot summer day. The comfort of air conditioning and of elaborate heat insulation, however, is far from being available to everyone. Most people just have to grin and bear it through a hot summer day. In the future, however, thermal control paints applied to building roofs and perhaps automobiles will help protect man from the burning sun.

To further improve these thermal-control paints, a study was conducted on the use of a vacuum-stripped (modified) silicone elastomer binder. The principal motivation for this effort was the belief that vacuum stripping the silicone would reduce thermal outgassing from the dry paint film. While an evaluation of outgassing was not a part of this study, some efforts were made to assess the magnitude of the outgassing problem. In theory, vacuum distillation of any polymeric material will have at least two different results. First, it will remove those components which have a significant vapor pressure (partial pressure) at the distillation temperature. Low boiling point and low molecular weight materials (e.g., silicone monomers, solvents, stabilizers, cure promoters) will thus be preferentially removed. Second, elevated distillation temperatures will promote cross-linking and polymerization, increasing the average molecular weight of the undistilled silicone.

In this development, the silicone elastomer is placed in the evacuating system, gradually heated to

160° C and held at this temperature for 24 hours. It is then cooled to room temperature in vacuum, producing an upgraded, low outgassing polymer of increased molecular weight. The process could be used to upgrade commercially available epoxies by devolatilization of low molecular weight constituents. Upgraded polymers could then be used as thermal paint bases as well as conformal-coating compounds, adhesives, and sealants.

Notes:

1. This subject may be of interest to manufacturers of paints, polymers, adhesives, etc.
2. Request for further information may be directed to:
Technology Utilization Officer
Marshall Space Flight Center
Code A&PS-TU
Marshall Space Flight Center, Alabama 35812
Reference: B73-10060

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel
Marshall Space Flight Center
Code A&PS-PAT
Marshall Space Flight Center, Alabama 35812

Source: J. E. Gilligan and
F. O. Rogers of
IIT Research Institute
under contract to
Marshall Space Flight Center
(MFS-21397)

Category 04